Indiana, Indian Territory, Maryland, Massachusetts, Missouri, New Jersey, New Mexico, Pennsylvania, Virginia, Wisconsin, and Wyoming; on from four to eight, inclusive, in California, Connecticut, District of Columbia, Idaho, Kentucky, Maine, Montana, Nevada, New Hampshire, Ohio, Rhode Island, Washington Territory, and West Virginia; and on two in Oregon. There was but one state or territory, Delaware, in which no thunder-storms were reported.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Fort Assinniboine, Mont., 8th: no rain has fallen in this section for three weeks. The soil is in need of rain, and the creeks and rivers are scantily fed by the mountain streams. The hay crop is everywhere reported short, and vegetation wears a parched appearance. 31st: 0.10 inch of rain fell during the month, and the water supply is giving out.

Helena, Mont.: the long-continued drought was broken by the heavy rain on the 19th.

Springfield, Mo., 25th: the drought of the last eleven days has been injurious to the corn crop and pasturage.

Fort Sully, Dak., 30th: the prevailing dry weather has seriously injured corn, oats, and other late crops in this section.

Motes, Ala.: the month has been unusually dry, and crops have suffered to some extent.—*Report of Mr. A. M. Weiler.*

Grand Haven, Mich., 31st: the prevailing drought in this section is severely affecting crops.

Port Huron, Mich., 31st: no rain has fallen in this section since the 30th of May, and the drought is beginning to entail hardship and suffering to the agricultural community. Wells in many places are dry, necessitating hauling of water long distances. Pastures are so dry that farmers are obliged to feed stock in the yards.

Thornville, Mich.: August was a continuation of the July drought and the damage done is very extensive. Corn and potatoes on the uplands are complete failures.—*Report of Mr. John S. Caulkins.*

Montevideo, Minn., 31st: all streams are the lowest ever known; mills on the Minnesota and Chippewa rivers are idle from lack of water. Corn is badly damaged by the severe drought.—*Report of Mr. L. G. Moyer.*

Belvidere, Ill., 29th: a destructive drought is prevailing in this and surrounding counties. Everything is literally burning up. There has been no rain during the month, and crops and pastures are suffering severely.—*Post-Express, Rochester, N. Y., August* 29.

Woonsocket, Dak., 31st: the ground is dryer than it has been for the past eight years. Corn, that promised a full crop on the 1st of the month, will not yield more than one-third, and oats and barley have also suffered considerable damage.—*Report of Mr. L. O. Libbey.*

Huron, Dak., 31st: the long and protracted drought, which was already felt on the 5th, has become very serious. Late crops are much injured; many farmers are cutting corn for use as fodder, as the ears cannot mature; wells are running dry, and the Dakota River is lower than ever known before.

Cresco, Iowa, 31st: the last half of the month has been very warm, dry, and dusty. Corn and potatoes are badly injured, and fall plowing is not practicable on account of drought.—*Report of Mr. Gregory Marshall.*

Dubuque, Iowa, 31st: the month has been the dryest on record; in many places wells and cisterns are dry; pasture land is parched, the grass is dead, and the cattle are fed on fodder as in winter.

Concordia, Kans., 31st: this section is suffering from a protracted drought.

New Frankfort, Mo., 31st: the month has been very warm and dry and all vegetation is suffering in consequence. The Missouri River at this point is the lowest ever known.—*Report of Mr. Geo. W. Hawkins.*

West Milton, Ohio, 31st: owing to the warm and dry weather during the month late corn is a failure, and all pastures are parched.—*Report of Mr. L. S. Motte.*

Tiffin, Ohio, 31st: the drought during the latter half of the month has become very severe; wells and cisterns are failing; pastures parched; wheat and potatoes suffering; and it is difficult to prepare the ground for autumn wheat.—*Report of Rev. T. H. Sonedecker.*

Brady, Tex., 31st: the drought has caused great injury to cotton, and the crop will be a failure over most of the county.—*Report of Mr. W. H. Potter.*

Taylor's Ranch, Utah, 31st: reports show that unusually dry weather prevails in Castle, Pleasant, Utah, Tintic, and Juab valleys, and that crops and fruit will fall short in those sections.

FOREST FIRES.

Boisé City, Idaho: forest fires were burning in the mountains, about thirty miles north and east of this city, on the 1st and 2d. Reports received on the 9th state that the fires were extinguished or under control.

Los Angeles, Cal., 16th: extensive forest fires prevailed on the hills east of this city during the day.

Phillipsburgh, Mont., 17th: this town is surrounded by forest fires, and all of Georgetown flat is burning. The strong wind during the day has brought the fires within six miles of this place.—*Denver, Colo., News, August* 17.

Seattle, Wash., 26th: for several weeks past this part of the country has been clouded by smoke, caused by extensive forest fires in every direction. The entire eastern slope of the Cascade Mountains, from Natchez Pass north to the boundary, is reported to be in flames.—*The Daily American, Nashville, Tenn., August* 27.

Port Huron, Mich.: fire broke out in the brush along the railroad west of this city during the forenoon of the 29th, and, owing to the prevailing drought, the fires spread rapidly, and several buildings were consumed. The fires in this immediate vicinity were extinguished on the 30th. Distant fires, west of this city, were observed on the 29th and 30th.

Hobart, Mich.: forest fires are raging in all directions.

Sullivan, Mich., 30th: forest fires are burning in the neighborhood, west of here, near Spencer's Mill. A great amount of damage has been done by them.—*Post-Express, Rochester, N. Y., August* 30.

Helena, Mont., 31st: destructive forest fires prevailed in this section during the entire month; many million feet of lumber and thousands of acres of timber have been consumed. The heavy rain on the 19th failed to put out the fires.

Portland, Oregon; 31st: the fires in the state during the month have caused considerable damage to the forests; fences, barns, and a few houses have been consumed. The rains during the latter part of the month have quenched them considerably.

Fort McKinney, Wyo., 31st: three large forest fires started in the mountains west and south of this place on the 20th, and they are still burning fiercely.

Forest fires were also reported as follows: Tuohy's, Cal., 14th, 15th; Red Bluff, Cal., 19th to 31st; Fort Buford, Dak., 7th; Fort Sill, Ind. T., 11th, 31st; Port Huron, Mich., 29th; Fort Custer, Mont., 24th; Powder River, Mont., 27th; Mount Washington, N. H., 6th.

PRAIRIE FIRES.

Pearsall, Tex., 4th: a recent prairie fire in this (Frio) county, which lasted several days, burned over nearly 5,000 acres of grass.—*Express, San Antonio, Tex., August* 6.

Miles City, Mont., 15th: the prairies, a few miles north and southeast of this place, are on fire. The fires cover several thousands of acres of land. Extensive prairie fires are also

raging in this county below Fallon, travelling towards Glendive. The fires were started by lightning during the storm on the evening of the 11th.—*The Chronicle, La Crosse, Wis., 15th.*

HALOS.

Solar halos were most frequently reported in New York, where they were noted on eleven days; in Illinois on ten; in Kansas on five, and on from one to four dates, inclusive, in Alabama, Florida, Indiana, Iowa, Kansas, Massachusetts, Michigan, Mississippi, Nebraska, Nevada, New Hampshire, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Virginia, and Wisconsin. In states and territories other than those named no solar halos were reported. They were reported in the greatest number of states and territories, five, on the 8th and 20th; in from one to four, inclusive, on the 1st to 7th, 9th to 16th, 18th, 19th, 21st to 26th, and 28th to 31st, inclusive. No solar halos were reported on the 17th and 27th. Arcade, N. Y.: on the 23d, at 11 a. m., a solar halo was formed with a radius of 22°. The halo above the sun was very brilliant through an arc of about 60°. The other section of the halo was fainter. Through the sun a faint circle appeared, with its centre on the vertical circle passing through the sun. The estimated radius of the circle passing through the sun was 45°. The circle was fairly well defined, except within the halo of 22° radius, where it was scarcely visible. The large circle lasted about half an hour; the smaller halo was visible at intervals all day.—*Report of Mr. H. M. Clough.* Wedgwood, N. Y.: a remarkable solar halo was observed from about 10 a. m. to 2 p. m., 23d, consisting of a brilliant prismatic circle about 45° in diameter concentric to the sun, and a circle of white light about 90° in diameter, the periphery of which cut the sun's disk and extended to the northward—*Report of Mr. O. F. Conwin.* Number Four, N. Y.: a brilliant halo appeared for about two hours in the middle of the day of the 23d. The ring exhibited the prismatic colors in a remarkable degree. Between the ring and the sun the sky was very dark. At the same time there was a slight misty arc or section of a ring about 40° from the sun to the north.—*Report of Mr. C. Fenton.*

Lunar halos were most frequently reported in North Carolina, where they were noted on eight days; in Virginia on six, and in Kansas on five; on from one to four days, inclusive, in Arizona, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Louisiana, Massachusetts, Michigan, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New York, Ohio, South Carolina, Tennessee, Texas, and Wisconsin. In states and territories other than those named no lunar halos were reported. They were reported in the greatest number of states and territories, seven, on the 4th; in six on the 5th, 6th, 7th; in from one to four, inclusive, on the 1st, 2d, 3d, 8th to 13th, inclusive, 15th, 17th, 20th, 23d, 27th, 29th, 30th, 31st. For dates other than those named no lunar halos were reported.

SUN SPOTS.

Mr. John W. James, Riley, Ill.: three groups of small and variable spots seen 1st to 17th; one group vanishing on the 4th, before reaching west edge; the spots at one end of one of the other groups had merged into one large spot, estimated 33,000 miles long and 23,000 miles wide. The large spot seen in June and July came around again, but very much smaller, disappearing by the solar rotation 20th. None seen then until the 27th, when a large spot was observed near the east edge, and on the sun's meridian on the 31st, estimated size, 27,000 miles in diameter. Mr. C. E. Buzzell, Leaf River, Ill.: the group of July 28th disappeared while on the meridian August 2d. August 1st, cloudy; 2d, a group of twenty-three spots, first observed near the east limb, passed the meridian 5th, west limb 11th; 8th, cloudy; 9th, new group, first observed three days east of meridian, disappeared 17th by rotation; 19th, one spot by rotation on east limb, disappeared by rotation 20th (probably third return of the June 16th disturbance); 27th, cloudy; 28th, well-defined spot on east limb by rotation, meridian September 2d. This spot was accompanied by prominent faculæ during entire revolution. Mr. M. A. Veeder, Lyons, N. Y.: 1st, an extensive group of spots was about five days advanced from the eastern limb. These spots faded out on 5th, and the faculæ remaining in their location disappeared by rotation on the 8th; 1st and 2d, also much faculæ and many small spots appeared by rotation. This group underwent many changes in its transit, fading out in part, and the remainder disappeared by rotation on 11th. 5th, much faculæ appeared by rotation; in connection with this group several spots formed on 9th and increased in size, disappearing by rotation on the 18th. 9th, a spot of considerable size, followed on succeeding days by much faculæ, appeared by rotation and completed its transit on the 22d; 16th, a bright faculæ appeared by rotation, but faded out during its transit; 26th, a large spot appeared by rotation and continued until the end of the month. Mr. H. D. Gowey, North Lewisburgh, Ohio: sun spots were observed from 1st to 19th, and from 29th to 31st, inclusive.

Haverford College Observatory, Pa., (observed by Prof. F. P. Leavenworth):

Date.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Faculæ.	
July, 1889.											
3, 3 p. m ...	0	2	0	0	0	0	1	4	....	....	Definition poor, thr'gh clouds.
5, 12 m.....	0	0	0	0	0	0	1	1	....	....	Definition poor, spots small.
6, 1 p. m ...	0	0	0	0	0	0	0	0	....	....	Definition poor.
8, 12 m.....	0	0	0	0	0	0	0	0	....	....	Definition poor.
11, 3 p. m...	1	2	0	0	0	0	1	2	....	....	Definition good.
12, 1 p. m ...	1	8	0	0	1	3	2	10	....	....	Definition good, large spot.
14, 5 p. m ...	0	7	0	0	0	0	2	17	....	....	Definition good.
15, 12 m	0	0	0	0	0	0	2	11	....	....	Definition good.
16, 11 a. m ...	0	0	0	0	0	0	2	11	....	....	Definition good.
17, 12 m.....	0	0	0	0	0	0	2	10	....	....	Definition good.
18. 10 a. m ...	0	0	0	0	0	0	2	22	....	....	Definition good.
20, 10 a. m ...	0	0	1	5	0	0	1	17	....	....	Definition poor.
22, 10 a. m ...	0	0	0	0	0	0	1	2	....	....	Definition poor.
23, 10 a. m ...	0	0	0	0	0	0	1	1	....	....	Definition good.
24, 10 a. m ...	0	0	0	0	0	0	1	1	....	....	Definition good.
25, 10 a. m ...	1	1	1	1	0	0	1	1	....	....	Definition good, small spot.
29, 11 a. m ...	1	21	0	0	0	0	2	22	....	....	Definition good, all small.
30, 10 a. m ...	0	0	0	0	0	0	2	22	....	....	Definition good.
31, 3 p. m	0	2	1	1	0	0	1	23	....	....	Definition poor.
August, 1889.											
1, 11 a. m ...	0	0	0	0	0	0	1	22	....	....	Definition poor.
2, 10 a. m ...	1	6	0	0	0	0	2	26	....	....	Definition fair.
3, 10 a. m ...	0	9	0	0	0	0	2	35	....	....	Definition good.
4, 3 p. m ...	0	0	1	11	0	0	1	21	....	....	Definition poor.
5, 3 p. m ...	0	0	0	0	0	0	1	24	....	....	Definition poor, 2 large spots.
6, 9 a. m ...	0	2	0	0	0	0	1	26	....	....	Definition good.
7, 10 a. m ...	0	24	0	0	0	0	1	50	....	....	Definition good, large spot breaking up.
8, 9 a. m ...	1	1	0	0	1	1	2	24	....	....	Definition good, 4 large spots.
10, 1 p. m ...	1	3	0	0	0	0	3	20	....	....	Definition poor.
11, 9 a. m ...	0	4	0	0	0	0	3	26	....	....	Definition good.
12, 10 a. m ...	0	0	1	4	0	0	2	9	....	....	Definition poor, 2 large spots.
13, 10 a. m ...	0	4	0	0	0	0	2	30	....	....	Definition good, 4 large spots.
14, 11 a. m ...	0	0	0	0	0	0	2	12	....	....	Definition good.
15, 1 p. m ...	0	0	0	0	0	0	2	14	....	....	Definition good.
16, 9 a. m ...	0	0	0	0	0	0	2	12	....	....	Definition good, 3 large spots.
17, 11 a. m ...	0	0	0	0	0	0	2	6	....	....	Definition good.
18, 9 a. m ...	0	0	1	5	0	0	1	1	....	....	Definition good, 1 large spot.
19, 10 a. m ...	1	1	0	0	1	1	2	2	....	....	Definition good.
20, 10 a. m ...	0	0	0	0	0	0	1	1	....	....	Definition good.
21, 9 a. m ...	1	1	1	1	0	0	1	1	....	....	Definition good.
22, 10 a. m ...	0	0	0	0	0	0	0	0	....	....	Definition poor.
23, 9 a. m ...	0	0	0	0	0	0	0	0	....	....	Definition poor.
24, 10 a. m ...	0	0	0	0	0	0	0	0	....	....	Definition good.
25, 4 p. m ...	0	0	0	0	0	0	0	0	....	....	Definition good.
26, 11 a. m ...	1	1	0	0	1	1	1	1	....	....	Definition poor, 1 large spot.

METEORS.

The distribution of meteors, by dates, was as follows: 1st, Keeler, Cal. 2d and 3d, Webster, Dak. 4th, Keeler, Cal.; Lansing, Mich. 5th, Little Rock, Ark. 6th, Mesquite, Tex. 8th, Duck, Ga.; Vevay, Ind. 10th, Little Rock, Ark.; Jacksonborough, Ohio. 11th, Whipple Barracks, Ariz.; Washington, N. C.; Jacksonborough, Ohio. 12th, Vevay, Ind.; Jacksonborough, Ohio. 14th, Mesquite, Tex. 15th, Brownsville, Tex. 17th, Mesquite, Tex. 18th, Whipple Barracks, Ariz.; Villa City, Fla.; Charleston, Ill.; Vevay, Ind.; North Billerica, Mass.; Beverly, N. J.; Bement, Ohio. 19th, Bement, Ohio; Lusk, Wyo. 20th, Villa City, Fla. 21st, Raleigh, N.

C.; Mesquite, Tex. 22d, Walla Walla, Wash. 23d, Charleston, Ill.; Vevay, Ind.; Riddleton, Tenn.; Cleburne, Tex. 25th, Kissimmee, Fla.; Beverly, N. J.; Cleburne, Tex. 27th, Keeler, Cal.; Riddleton, Tenn.; Mesquite, Tex. 28th, Vevay, Ind.; Muscatine, Iowa; North Sutton, N. H.; Carrollton, Ohio. 29th, Red Bluff, Cal.; North Sutton, N. H.; Green Bay, Wis. 30th, Red Bluff, Cal.; Lacon, Ill.; Kalamazoo, Mich. 31st, Spearfish, Dak.

Duck, Ga.; a large meteor was observed at 8 p. m., 11th. It shot across the sky from north to west about 20° above the horizon. Its duration was about six seconds.—*Report of Mr. A. L. Gillespie.*

Mesquite, Tex.: two large meteors were observed near the North star at 8 p. m., 14th. The first one started about 20° south and east of the North star; the second one started about 10° southeast of the North star, and travelled south to a point north and 20° west of Jupiter; this one was very brilliant and left a visible path of sparks. Eight smaller meteors were seen at this observation within a space of forty-five minutes.—*Report of Mr. Silas G. Lackey.*

Walla Walla, Wash.: a brilliant meteor was observed at about 8 p. m., 22d, moving in a southeasterly course toward the earth; before it disappeared it exploded, lighting up the sky like a flash of lightning.—*The Daily Union, Walla Walla, Wash., August* 23.

Red Bluff, Cal.: nine small meteors were observed about 15° north of the zenith, between 1.15 a. m. and 2 a. m., 29th. Their general course was southeast, though a few deflected to the southwest. Two other small meteors were observed at 1.10 a. m., 30th.

Green Bay, Wis: a brilliant meteor of a golden color, tinged with red, and accompanied by a luminous trail, about 5° long, was observed at 9.30 p. m., 29th. It started near the zenith, moved in a northeasterly direction, and when about 40° above the horizon broke into numerous fragments. The display lasted about ten seconds.

Spearfish, Dak.: a brilliant meteor was observed at 7.30 p. m., 31st. It shot down from north to south, and when close to the horizon it appeared to explode with a flash like burning powder. Its duration was about three seconds.—*Report of Mr. G. H. Warren.*

MIRAGE.

Mirage were observed as follows: Webster, Dak., 2d; Woonsocket, Dak., 3d, 4th; Hampton, Iowa, 16th.

SAND STORMS.

Winnemucca, Nev., 31st: a gale and sand storm began at 1.05 p. m. and continued until 11.20 p. m.; maximum velocity of the wind forty-four miles per hour from the southwest at 5.35 p. m., and the average velocity during the storm was thirty-two miles per hour. A great deal of electricity was present in the atmosphere during the storm, and a perceptible shock was felt with the finger four inches away from an electric wire. Sand storms were also reported as follows: Wilcox, Ariz., 4th, 9th, 21st; Tuohy's, Cal., 15th; Fresno, Cal., 18th; Dodge City, Kans., 3d; Winnemucca, Nev., 17th, 18th.

VERIFICATIONS.

FORECAST FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for August, 1889, were made by Captain H. H. C. Dunwoody, 4th Artillery, Signal Officer and Assistant, and those for the Pacific Coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps.

Percentages of forecasts verified, August, 1889.

States.		States.	
Maine	83.0	Tennessee	88.5
New Hampshire	83.7	Kentucky	88.6
Vermont	81.8	Ohio	85.7
Massachusetts	84.5	West Virginia	85.0
Rhode Island	86.6	Indiana	90.5
Connecticut	80.3	Illinois	89.8
Eastern New York	84.3	Lower Michigan	88.6
Western New York	84.2	Upper Michigan	78.8
Eastern Pennsylvania	85.9	Wisconsin	85.0
Western Pennsylvania	84.8	Minnesota	87.7
New Jersey	82.6	Iowa	86.3
Delaware	87.1	Kansas	81.0
Maryland	89.5	Nebraska	85.2
District of Columbia	84.8	Missouri	88.0
Virginia	88.8	Colorado	86.6
North Carolina	85.4	Dakota	89.9
South Carolina	88.7	Southern California*	86.9
Georgia	85.4	Northern California*	89.2
Eastern Florida	91.4	Oregon*	88.8
Western Florida	82.5	Washington Territory*	86.7
Alabama	87.6	*By elements:* Weather	88.3
Mississippi	93.2	Temperature‡	83.2
Louisiana	88.5		
Texas	90.6	Monthly percentage of weather and temperature combined†	86.3
Arkansas	86.3		

*In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. †The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10. ‡The forecasts of temperature in districts east of the Rocky Mountains were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day.

CAUTIONARY SIGNALS FOR AUGUST, 1889.

Statement showing percentages of justifications of wind signals for the month of August, 1889:

Wind signals.—(Ordered by Captain H. H. C. Dunwoody.) Total number of signals ordered, forty-six; justified as to velocity, wholly, thirty; justified as to direction, forty-five. Of the signals ordered forty-five were cautionary, of which twenty-nine were justified, and one storm, which was justified. Eighteen were ordered for easterly winds, of which seventeen were justified, and twenty-eight were ordered for westerly winds, all of which were justified. Percentage of justifications, 66.8.

Percentages of local verifications of weather and temperature signals as reported by directors of the various State Weather Services for August, 1889.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	86.9	86.7	Nebraska	90.0	88.6
Indiana	89.0	89.0	New Jersey	85.1	92.9
Kansas	82.1	86.7	New York	87.5	88.8
Kentucky	79.0	95.0	Ohio	92.0	87.0
Michigan	81.5	85.7	Pennsylvania	84.0	90.0
Minnesota	83.0	79.0	South Carolina	85.5	89.0

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts are republished from reports for August, 1889, of the directors of the various state weather services:

ALABAMA.

The month just closed has been remarkable for the small amount of rainfall in middle and southern Alabama and the heavy precipitation in northern parts of the state. The average rainfall was 0.80 below the normal. In all portions of the state, except in north Alabama, there has been a deficiency since the 1st of January, and in many localities the wells are going dry. The temperature was normal. There were no decidedly hot days, and the nights were cool and pleasant.

SUMMARY.

Temperature.—Monthly mean, 76; highest monthly mean, 80, at Citronelle